

**Appendix I**

**Toxicity Reference Values for  
Each Contaminant/Functional Group**

**Table I-1.** Compilation of toxicity reference values (TRVs in mg/kg-day) for mammalian functional groups.

Chemical	TRV for M121	TRV for M122	TRV for M122A	TRV for M123	TRV for M210	TRV for M210A	TRV for M222	TRV for M322	TRV for M422	TRV for M422A
2-Methylnaphthalene (Mouse - Cancer) <sup>a</sup>	a	a	a	a	a	a	a	a	a	a
2-Methylnaphthalene (Rat - Cancer) <sup>a</sup>	a	a	a	a	a	a	a	a	a	a
Acetone (Mouse and Rat - NOAEL)	8.3	8.3	8.3	8.3	8.3	8.3	8.3	8.3	13	13
Antimony (Mouse - NOAEL)	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.23	0.35	0.35
Arsenic (Dog - NOAEL)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.16	0.32
Arsenic (Mouse - LOAEL)	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.08	0.08
Arsenic (Rat - NOAEL)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.39	0.39
Arsenic (Sheep - NOAEL)	0.06	0.06	0.06	0.06	0.04	0.04	0.04	0.04	0.04	0.04
Barium (Rat - NEL)	47.5	47.5	47.5	47.5	47.5	47.5	47.5	47.5	71.2	71.2
Barium (Dog - FEL-1)	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.36	0.73
Barium Chloride (Rat - NOAEL)	5.81	5.81	5.81	5.81	5.81	5.81	5.81	5.81	8.71	8.71
Benzene (Mouse - LOAEL)	3.66	3.66	3.66	3.66	3.66	3.66	3.66	3.66	5.49	5.49
Benzene (Mouse and Rat - FEL)	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	1.0	1.0
Benzo(a)anthracene (Mouse - FEL)	9.3	9.3	9.3	9.3	9.3	9.3	9.3	9.3	14	14
Benzo(a)pyrene (Mouse - FEL)	92.6	92.6	92.6	92.6	92.6	92.6	92.6	92.6	139	139
Benzo(a)pyrene (Mouse - Cancer)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03
Benzo(b)fluoranthene (BbF) (Mouse - LOAEL)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03
Benzo(ghi)perylene <sup>b</sup>	a	a	a	a	a	a	a	a	a	a
Benzo(k)fluoranthene <sup>b</sup>	a	a	a	a	a	a	a	a	a	a
Cadmium (Rat - LOAEL)	8E-4	8E-4	8E-4	8E-4	8E-4	8E-4	8E-4	8E-4	1E-3	1E-3
Chromium (III) (Rat - NOAEL)	250	250	250	250	250	250	250	250	375	375
Chrysene <sup>b</sup> (Mouse - LOAEL)	b	b	b	b	b	b	b	b	b	b
Cobalt (Dog - NOAEL)	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	2.1	2.1

**Table I-1.** (continued).

Chemical	TRV for M121	TRV for M122	TRV for M122A	TRV for M123	TRV for M210	TRV for M210A	TRV for M222	TRV for M322	TRV for M422	TRV for M422A
Cobalt (Rat - NOAEL)	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.21	0.21
Copper (Mink - NOAEL)	0.437	0.437	0.437	0.437	0.437	0.437	0.437	1.31	0.437	0.437
Copper (Rat - NOAEL)	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	2.8	2.8
<b>Dibenzo(a,h)anthracene<sup>a</sup></b>										
<b>Indeno(1,2,3-cd)pyrene<sup>a</sup></b>										
Lead (Bovine - LD <sub>50</sub> )	0.038	0.038	0.038	0.038	0.025	0.025	0.025	0.025	0.025	0.025
Lead (Dog - NOAEL)	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	1.6	3.3
Lead (Dog - FEL)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.009	0.018
Lead (Rat - NOAEL)	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.18	0.18
<b>Lead (Rat - NOAEL)</b>	<b>2.7</b>	<b>4.0</b>	<b>4.0</b>							
<b>Manganese (Rat - NOAEL)</b>	<b>29</b>	<b>44</b>	<b>44</b>							
Mercury (Inorganic) (Mouse - NOAEL)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.17	0.17
<b>Mercury (Inorganic) (Swine - NOAEL)</b>	<b>0.021</b>	<b>0.031</b>	<b>0.031</b>							
Mercury (Organic) (Bovine - NOAEL)	0.006	0.006	0.006	0.006	0.004	0.004	0.004	0.004	0.004	0.004
Mercury (Organic) (Mink - NOAEL)	0.019	0.019	0.019	0.019	0.013	0.013	0.013	0.013	0.013	0.013
Mercury (Organic) (Mouse - NOAEL)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.04	0.04
Mercury (Organic) (Swine - NOAEL)	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0021	0.0031	0.0031
Mercury (Organic) (Rat - NOAEL)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.013	0.013
<b>Mercury (Organic) (Rat - NOAEL)</b>	<b>0.0083</b>	<b>0.013</b>	<b>0.013</b>							
Mercury (Organic) (Deer - LD <sub>50</sub> )	0.11	0.11	0.11	0.11	0.07	0.07	0.07	0.07	0.07	0.07
Mercury (Organic) (Cat - NOAEL)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.005	0.002	0.003

**Table I-1.** (continued).

Chemical	TRV for M121	TRV for M122	TRV for M122A	TRV for M123	TRV for M210	TRV for M210A	TRV for M222	TRV for M322	TRV for M422	TRV for M422A
Nickel (Bovine - NOAEL)	0.11	0.11	0.11	0.11	0.08	0.08	0.08	0.08	0.08	0.08
Nickel (Dog - NOAEL)	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2	6.3	13
Nickel (Rat - NOAEL)	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	1.3	1.3
Nitrate (Rabbit - AEL)	83.21	83.21	83.21	83.21	55.47	55.47	55.47	55.47	55.47	55.47
PCBs - Aroclor 1254 (Mouse - FEL)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.038	0.038
PCBs - Aroclor 1254 (Mink - NOAEL)	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.137	0.046	0.046
PCBs - Aroclor 1254 (Rat - NOAEL)	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.16	0.16
PCBs - Aroclor 1254 (Mink - NOAEL)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.015	0.005	0.005
Pyrene (Mouse - NOAEL)	13	13	13	13	13	13	13	13	19	19
Selenium (Mouse - FEL)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.06	0.06
Selenium (Rat - NOAEL)	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.038	0.038
Selenium (Sheep - FEL)	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01
Silver (Mouse - FEL)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.3	1.3
Sulfate (Rat - LD <sub>90</sub> )	5.32	5.32	5.32	5.32	5.32	5.32	5.32	5.32	7.98	7.98
Thallium (Rat - FEL)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.06	0.06
Thallium (Rat - LOAEL)	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.06	0.06
Total Petroleum Hydrocarbon <sup>c</sup>	c	c	c	c	c	c	c	c	c	c
Vanadium (Bovine - NOAEL)	0.47	0.47	0.47	0.47	0.31	0.31	0.31	0.31	0.31	0.31
Vanadium (Mouse - NOAEL)	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.68	0.68
Xylene (Mouse - NOAEL)	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.129	0.129
Xylene (Rat - NOAEL)	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8	31.3	31.3
Zinc (Ferret - NOAEL)	3.94	3.94	3.94	3.94	3.94	3.94	3.94	11.8	3.94	5.92
Zinc (Rat - NOAEL)	14	14	14	14	14	14	14	14	21	21

**Table I-1.** (continued).

Chemical	TRV for M121	TRV for M122	TRV for M122A	TRV for M123	TRV for M210	TRV for M210A	TRV for M222	TRV for M322	TRV for M422	TRV for M422A
a. Values for benzo(a)pyrene used										
b. Dermal exposure										
c. Values for benzene used										
No data located for:										
Chloromethane										
Dibenzofuran										
4-Methyl-2-pentanone										
Pentachlorophenol										

**Table I-2.** Compilation of toxicity reference values (TRVs in mg/kg-day) for avian functional groups.

Chemical	TRV for AV121	TRV for AV122	TRV for AV132	TRV for AV142	TRV for AV143	TRV for AV210	TRV for AV210A	TRV for AV221	TRV for AV222	TRV for AV222A	TRV for AV232
Arsenic (Brown-headed cowbird -Mortality)	0.046	0.046	0.046	0.046	0.046	0.069	0.069	0.069	0.069	0.069	0.069
Arsenic (Mallard - NOAEL)	0.64	0.64	0.64	1.29	1.29	0.43	0.43	0.43	0.43	0.43	0.43
Arsenic (Mallard - LD <sub>50</sub> )	0.24	0.24	0.24	0.48	0.48	0.16	0.16	0.16	0.16	0.16	0.16
Cadmium (Black Duck - LOAEL)	0.04	0.04	0.04	0.07	0.07	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium (Chicken - LOAEL)	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Chromium-III (Chicken - NOAEL)	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Cobalt (Chicken - LOAEL)	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.213
Copper (Chicken - NOAEL)	27.89	27.89	27.89	27.89	27.89	27.89	27.89	27.89	27.89	27.89	27.89
Copper (Chicken - NOAEL)	4.61	4.61	4.61	4.61	4.61	4.61	4.61	4.61	4.61	4.61	4.61
Lead (Chicken - NOAEL)	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48
Lead (European Starling - LOAEL)	0.03	0.03	0.03	0.03	0.03	0.04	0.08	0.04	0.04	0.04	0.04
Manganese (Chicken - NOAEL)	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0	70.0
Manganese (Japanese Quail - NOAEL)	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Mercury (Inorganic) (Japanese quail - NOAEL)	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Mercury (Inorganic) (Chicken - NOAEL)	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02	2.02
Mercury (Organic) (American black duck - AEL)	0.0047	0.0047	0.0047	0.0094	0.0094	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031
Mercury (Organic) (Mallard - LOAEL)	0.012	0.012	0.012	0.024	0.024	0.008	0.008	0.008	0.008	0.008	0.008
Mercury (Organic) (Pheasant - AEL)	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Mercury (Organic) (Pheasant - LOAEL)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Nickel (Chicken - NOAEL)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Nickel (Mallard - NOAEL)	8.75	8.75	8.75	17.5	17.5	5.83	5.83	5.83	5.83	5.83	5.83
Nickel (Mallard - NOAEL)	50	50	50	100	100	33	33	33	33	33	33

**Table I-2.** (continued).

Chemical	TRV for AV121	TRV for AV122	TRV for AV132	TRV for AV142	TRV for AV143	TRV for AV210	TRV for AV210A	TRV for AV221	TRV for AV222	TRV for AV222A	TRV for AV232
Nitrate (Turkey - FEL)	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9	8.9
PCBs (1254) (Pheasant - LOAEL)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Selenium (Black Crowned Night Heron - LOAEL)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Selenium (Chicken - NOAEL)	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033
Selenium (Mallard - NOAEL)	0.13	0.13	0.13	0.25	0.25	0.08	0.08	0.08	0.08	0.08	0.08
Sulfate (Turkey - NOAEL)	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64	8.64
Thallium (Quail - FEL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Vanadium (Chicken - NOAEL)	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Vanadium (Mallard - NOAEL)	0.13	0.13	0.13	0.25	0.25	0.08	0.08	0.08	0.08	0.08	0.08
Zinc (Chicken - LOAEL)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Zinc (Mallard - LOAEL)	12.9	12.9	12.9	25.9	25.9	8.63	8.63	8.63	8.63	8.63	8.63

**Table I-2.** (continued).

Chemical	TRV for AV233	TRV for AV241	TRV for AV242	TRV for AV310	TRV for AV322	TRV for AV333	TRV for AV342	TRV for AV422	TRV for AV432	TRV for AV433	TRV for AV442
Arsenic (Brown-headed cowbird - Mortality)	0.069	0.069	0.069	0.046	0.046	0.046	0.046	0.046	0.046	0.046	0.046
Arsenic (Mallard - NOAEL)	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43	0.43
Arsenic (Mallard - LD <sub>50</sub> )	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Cadmium (Black Duck - LOAEL)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Cadmium (Chicken - LOAEL)	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.27	0.27	0.27	0.27
Chromium-III (Chicken - NOAEL)	1.4	1.4	1.4	1.4	1.4	1.4	1.4	2.0	2.0	2.0	2.0
Cobalt (Chicken - LOAEL)	0.213	0.213	0.213	0.213	0.213	0.213	0.213	0.319	0.319	0.319	0.319
Copper (Chicken - NOAEL)	27.89	27.89	27.89	27.89	27.89	27.89	27.89	41.92	41.92	41.92	41.92
Copper (Chicken - NOAEL)	4.61	4.61	4.61	4.61	4.61	4.61	4.61	6.91	6.91	6.91	6.91
Lead (Chicken - NOAEL)	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.72	0.72	0.72	0.72
Lead (European Starling - LOAEL)	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Manganese (Chicken - NOAEL)	70.0	70.0	70.0	70.0	70.0	70.0	70.0	105	105	105	105
Manganese (Japanese Quail - NOAEL)	21.3	21.3	21.3	21.3	21.3	21.3	21.3	31.9	31.9	31.9	31.9
Mercury (Inorganic) (Japanese quail - NOAEL)	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.24	0.24	0.24	0.24
Mercury (Inorganic) (Chicken - NOAEL)	2.02	2.02	2.02	2.02	2.02	2.02	2.02	3.03	3.03	3.03	3.03
Mercury (Organic) (American black duck - AEL)	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031	0.0031
Mercury (Organic) (Mallard - LOAEL)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Mercury (Organic) (Pheasant - AEL)	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.0059	0.0059	0.0059	0.0059
Mercury (Organic) (Pheasant - LOAEL)	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.008	0.008	0.008	0.008
Nickel (Chicken - NOAEL)	2.1	2.1	2.1	2.1	2.1	2.1	2.1	3.1	3.1	3.1	3.1

**Table I-2.** (continued).

Chemical	TRV for AV233	TRV for AV241	TRV for AV242	TRV for AV310	TRV for AV322	TRV for AV333	TRV for AV342	TRV for AV422	TRV for AV432	TRV for AV433	TRV for AV442
Nickel (Mallard - NOAEL)	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83	5.83
Nickel (Mallard - NOAEL)	33	33	33	33	33	33	33	33	33	33	33
Nitrate (Turkey - FEL)	8.9	8.9	8.9	8.9	8.9	8.9	8.9	13.4	13.4	13.4	13.4
PCBs (1254) (Pheasant - LOAEL)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.11	0.11	0.11	0.11
Selenium (Black Crowned Night Heron - LOAEL)	0.10	0.10	0.10	0.16	0.16	0.16	0.16	0.10	0.10	0.10	0.10
Selenium (Chicken - NOAEL)	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.050	0.050	0.050	0.050
Selenium (Mallard - NOAEL)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Sulfate (Turkey - NOAEL)	8.64	8.64	8.64	8.64	8.64	8.64	8.64	12.96	12.96	12.96	12.96
Thallium (Quail - FEL)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.07	0.07	0.07	0.07
Vanadium (Chicken - NOAEL)	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.21	0.21	0.21	0.21
Vanadium (Mallard - NOAEL)	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Zinc (Chicken - LOAEL)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0	3.0	3.0
Zinc (Mallard - LOAEL)	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63	8.63

No data located for:	Benzo(k)flouranthene	Pentachlorophenol
Acetone	Chloromethane	Pyrene
Antimony	Chrysene	Silver
Barium	Dibenzo(a,h)anthracene	TPH
Benzo(a)anthracene	Dibenzofuran	Xylene
Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	
Benzo(b)fluoranthene	2-Methylnaphthalene	
Benzo(g,h,i)perylene	4-Methyl-2-pentanone	

COPC:

Acetone CAS 67-64-1

**Test Organisms:** Rat and Mouse (Omnivore, Order-Rodentia)  
**Exposure Medium:** Oral (gavage)  
**Test Endpoint:** NOAEL  
**Reference:** EPA, 1986, *Ninety-Day Gavage Study in Albino Rats Using Acetone*, Office of Solid Waste, Washington, DC.  
**QCE:** 100 mg/kg-day

Adjustment Factors (AF)				Justification for adjustment factor
R	1	2	3	R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level
I	2	2	2	30 each sex/treatment group evaluated. No juveniles tested.
Q <sub>1</sub>	1	1	1	Ecologically relevant endpoint
Q <sub>2</sub>	1	1	1	Chronic (90-day) study
Q <sub>3</sub>	1	1	1	NOAEL
U	2	2	2	Numerous endpoints measured. Adequate number of animals tested. Supporting chronic toxicity and reproductive studies are lacking.
Total AF	4	8	12	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U = Total AF
QCE (mg/kg-day)	100	100	100	QCE = quantified critical endpoint
TRV	25	13	8.3	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	25	Test organism is in the same order and trophic level as the functional group members	none
2	13	Test organism is in a different order and same trophic level from the functional group members	M422, M422A
3	8.3	Test organism is in a different order and trophic level from the functional group members	M122, M122A, M121, M123, M132 M210, M210A, M222, M322

**COPC:****Antimony (Antimony Potassium Tartrate) CAS 7440-36-0**

**Test Organisms:** Mouse (Omnivore, Order-Rodentia)  
**Exposure Medium:** Water  
**Test Endpoint:** NOAEL Apparent slight decrease in life span of female CD-1 mice (significance unknown)  
**Reference:** Schroeder, H.A., M. Mitchner, and J.J. Balassa, 1968, *Zirconium, Niobium, Antimony and Fluorine in Mice: Effects of Growth Survival and Tissue Levels*, Journal of Nutrition, 95:95-101.  
Kanisawa, M. and H.A. Schroeder, 1969, "Life term studies on the effect of trace elements on spontaneous tumor in mice and rats." *Cancer Research*, 29(4):892-895.  
**QCE:** 0.35 mg/kg-day      5mg/L\*7.0mL/100g-day\*L/1000mL\*1000g/1kg

Adjustment Factors (AF)				Justification for adjustment factor
R	1	2	3	R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level
I	1	1	1	Chronic toxicity studies with adequate numbers of animals.
Q <sub>1</sub>	0.5	0.5	0.5	Endpoint could occur, but of uncertain ecological significance
Q <sub>2</sub>	1	1	1	Chronic study
Q <sub>3</sub>	1	1	1	NOAEL endpoint
U	2	2	2	Large chronic study, but no reproductive endpoints examined.
M	0.5	0.5	0.5	Soluble salts in the drinking water were used
Total AF	0.5	1.0	1.5	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U *M = Total AF
QCE (mg/kg-day)	0.35	0.35	0.35	QCE = quantified critical endpoint
TRV	0.70	0.35	0.23	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.70	Test organism is in the same order and trophic level as the functional group members	none
2	0.35	Test organism is in a different order and same trophic level from the functional group members	M422, M422A
3	0.23	Test organism is in a different order and trophic level from the functional group members	M122, M122A, M121, M123, M132 M210, M210A, M222, M322

**COPC:****Arsenic CAS 7440-38-2**

<b>Test Organisms:</b>	Brown-headed cowbird (Insectivore, Order-Passeriformes)
<b>Exposure Medium:</b>	NA
<b>Test Endpoint:</b>	Mortality
<b>Reference:</b>	US Fish and Wildlife Service, 1969, Bureau of Sport Fisheries and Wildlife, Publication 74, pp 56-57.
<b>QCE:</b>	2.46 mg/kg-day

Adjustment Factors (AF)				Justification for adjustment factor
R	1	2	3	R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level
I	2	2	2	Males only.
Q <sub>1</sub>	1	1	1	Mortality
Q <sub>2</sub>	1	1	1	Chronic (7 months)
Q <sub>3</sub>	3	3	3	Mortality
U	3	3	3	Four dose levels- both a LOAEL and NOAEL established
Total AF	18	36	54	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U = Total AF
QCE (mg/kg-day)	2.46	2.46	2.46	QCE = quantified critical endpoint
TRV	0.137	0.069	0.046	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.137	Test organism is in the same order and trophic level as the functional group members	none
2	0.069	Test organism is in a different order and same trophic level from the functional group members	AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV241, AV242
3	0.046	Test organism is in a different order and trophic level from the functional group members	AV121AV122, AV132, AV142, AV143, AV310, AV322, AV333, AV342, AV422, AV432, AV433, AV442

COPC:

Arsenic CAS 7440-38-2

Test Organisms:

Mallard (Herbivore, Order-Anseriformes)

Exposure Medium:

NA

Test Endpoint:

LD<sub>50</sub>

Reference:

National Academy of Sciences (NAS), 1977, *Arsenic*, Washington DC.

QCE:

39 mg/kg-day

Adjustment Factors (AF)				Justification for adjustment factor
R	1	2	3	R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level
I	3	3	3	Secondary source with little supporting variation data.
Q <sub>1</sub>	1	1	1	Relevant effect (mortality).
Q <sub>2</sub>	3	3	3	Study duration was acute
Q <sub>3</sub>	3	3	3	LD <sub>50</sub>
U	3	3	3	Old study, secondary source (supporting info only)
Total AF	81	162	243	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U = Total AF
QCE (mg/kg-day)	39	39	39	QCE = quantified critical endpoint
TRV	0.48	0.24	0.16	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.48	Test organism is in the same order and trophic level as the functional group members	AV142, AV143
2	0.24	Test organism is in a different order and same trophic level from the functional group members	AV121, AV122, AV132
3	0.16	Test organism is in a different order and trophic level from the functional group members	AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV241, AV242, AV310, AV322, AV333, AV342, AV422, AV432, AV433, AV442

**COPC:****Arsenic CAS 7740-38-2**

**Test Organisms:** Domestic sheep (Herbivore, Order-Artiodactyla)  
**Exposure Medium:** Diet  
**Test Endpoint:** NOAEL  
**Reference:** Eisler, R. 1988, *Arsenic Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*, US Fish and Wildlife Service Biological Report, 85(1.12):92pp.  
**QCE:** 2.3 mg/kg-day

Adjustment Factors (AF)	1	2	3	Justification for adjustment factor
R				R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level
I	3	3	3	Secondary source with no data regarding variability of response.
Q <sub>1</sub>	1	1	1	Relevant effect.
Q <sub>2</sub>	2	2	2	Subacute duration.
Q <sub>3</sub>	1	1	1	NOEL endpoint.
U	3	3	3	Secondary source, only one dose level.
Total AF	18	36	54	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U = Total AF
QCE (mg/kg-day)	2.3	2.3	2.3	QCE = quantified critical endpoint
TRV	0.13	0.06	0.04	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.13	Test organism is in the same order and trophic level as the functional group members	none
2	0.06	Test organism is in a different order and same trophic level from the functional group members	M121, M122, M122A, M123, M132
3	0.04	Test organism is in a different order and trophic level from the functional group members	M210, M210A, M222, M322, M422, M422A

**COPC:****Arsenic CAS 7778-43-0**

**Test Organisms:** Mallard (Herbivore, Order-Anseriformes)  
**Exposure Medium:** Oral in diet (Arsenic as sodium arsenite)  
**Test Endpoint:** NOAEL  
**Reference:** U.S. Fish and Wildlife Service. 1964. Pesticide-wildlife studies, 1963: a review of Fish and Wildlife Service investigations during the calendar year. FWS Circular 199.  
**QCE:** 5.14 mg/kg-day       $((51.35 \text{mg As/kg food}) * (0.1 \text{ kg food/day})) / (1 \text{kg BW})$

Adjustment Factors (AF)	1	2	3	Justification for adjustment factor
R	1	2	3	Same trophic level but different order than members of functional groups
I	2	2	2	
Q <sub>1</sub>	1	1	1	Mortality, is ecologically relevant
Q <sub>2</sub>	1	1	1	Chronic duration (over 128 days)
Q <sub>3</sub>	1	1	1	NOAEL
U	2	2	2	Multiple doses (100, 250, 500, and 1000 ppm sodium arsenite) examined with both a NOAEL and a LOAEL established. However, no reproductive endpoints examined.
Total AF	4	8	12	$R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$
QCE (mg/kg-day)	5.14	5.14	5.14	QCE = quantified critical endpoint
TRV	1.29	0.64	0.43	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	1.29	Test organism is in the same order and trophic level as the functional group members	AV142, AV143
2	0.64	Test organism is in a different order and same trophic level from the functional group members	AV121, AV122, AV132
3	0.43	Test organism is in a different order and trophic level from the functional group members	AV210, AV210A, AV221, AV222, AV222A, AV232, AV233, AV241, AV242, AV310, AV322, AV333, AV342, AV422, AV432, AV433, AV442

**COPC:****Arsenic CAS 7778-43-0**

**Test Organisms:** Dog (Omnivore, Order-Carnivora)  
**Exposure Medium:** Diet as sodium arsenite or sodium arsenate  
**Test Endpoint:** NOAEL  
**Reference:** Byron, W.R., et al., 1967, "Pathologic changes in rats and dogs from two-year feeding of sodium arsenite or sodium arsenate," *Toxicology and Applied Pharmacology*, 10:132-147.  
**QCE:** 1.28 mg/kg-day       $(50 \text{ mg/kg food}) * (0.24 \text{ kg food /day}) / (9.41 \text{ kg BW})$

Adjustment Factors (AF)				Justification for adjustment factor
R	1	2	3	R = 1 is AF for same order and trophic level R = 2 is AF for different order and same trophic level R = 3 is AF for different order and trophic level
I	2	2	2	Reasonable number of males and females studied (24)
Q <sub>1</sub>	1	1	1	Weight loss, survival, endpoint ecologically significant
Q <sub>2</sub>	1	1	1	Chronic study (2 years)
Q <sub>3</sub>	1	1	1	NOAEL
U	2	2	2	Reasonable study, but no reproductive endpoints examined in the two years.
Total AF	4	8	12	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U = Total AF
QCE (mg/kg-day)	1.28	1.28	1.28	QCE = quantified critical endpoint
TRV	0.32	0.16	0.11	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.32	Test organism is in the same order and trophic level as the functional group members	M422A
2	0.16	Test organism is in a different order and same trophic level from the functional group members	M422
3	0.11	Test organism is in a different order and trophic level from the functional group members	M121, M122, M122A, M123, M210, M210A, M222, M322

\*Ingestion rate specified

COPC:	Arsenic CAS 7778-43-0		
Test Organisms:	Rat (Omnivore, Order-Rodentia)		
Exposure Medium:	Diet as sodium arsenate or sodium arsenite		
Test Endpoint:	NOAEL		
Reference:	Byron, W.R., et al., 1967, "Pathologic changes in rats and dogs from two-year feeding of sodium arsenite or sodium arsenate," <i>Toxicology and Applied Pharmacology</i> , 10:132-147.		
QCE:	3.1mg/kg-day (62.5 mg/kg food)*(0.0189kg/day)/(0.382 kg BW)		

Adjustment Factors (AF)				Justification for adjustment factor
	1	2	3	
R	1	2	3	Different trophic level and order than members of functional groups.
I	2	2	2	300 weanling Data do not show a good dose-response curve low-dose range.
Q <sub>1</sub>	1	1	1	Levels of 62.5 ppm Arsenic as arsenite and 125 ppm Arsenic as arsenate did not cause common bile duct enlargement and did not affect survival. Weight was slightly reduced in females at the 62.5 ppm Arsenic as arsenite.
Q <sub>2</sub>	1	1	1	Chronic study.
Q <sub>3</sub>	1	1	1	NOAEL using lowest NOAEL from either arsenite or arsenate
U	2	2	2	Good overall design, but no reproductive studies in the two years.
Total AF	4	8	12	R * I * Q <sub>1</sub> * Q <sub>2</sub> * Q <sub>3</sub> * U = Total AF
QCE (mg/kg-day)	3.1	3.1	3.1	QCE = quantified critical endpoint
TRV	0.78	0.39	0.26	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.78	Test organism is in the same order and trophic level as the functional group members	none
2	0.39	Test organism is in a different order and same trophic level from the functional group members	M422, M422A
3	0.27	Test organism is in a different order and trophic level from the functional group members	M122, M122A, M121, M123, M132 M210, M210A, M222, M322

**COPC:** Arsenic CAS 7778-43-0

**Test Organisms:** Mice (Omnivore, Order-Rodentia)

**Exposure Medium:** Diet as sodium arsenate or sodium arsenite

**Test Endpoint:** LOAEL

**Reference:** Schroeder, H.A., and M. Mitchner, 1971. *Toxic effects of trace elements on the reproduction of mice and rats.* Arch. Environ. Health. 23:102-106.

**QCE:** 1.25 mg/kg-day       $((5.00 \text{ mg As/L H}_2\text{O}) * (0.0075 \text{ L/day})) / (0.003 \text{ kg BW})$

Adjustment Factors (AF)	1	2	3	Justification for adjustment factor
R	1	2	3	Different trophic level and order than members of functional groups.
I	2	2	2	3 generations, however only one dosage
Q <sub>1</sub>	1	1	1	Declining litter sized with each successive generation
Q <sub>2</sub>	1	1	1	Chronic study.
Q <sub>3</sub>	2	2	2	LOAEL
U	2	2	2	Only one dose level, no NOAEL established.
Total AF	8	16	24	$R * I * Q_1 * Q_2 * Q_3 * U = \text{Total AF}$
QCE (mg/kg-day)	1.25	1.25	1.25	QCE = quantified critical endpoint
TRV	0.16	0.08	0.052	Toxicity Reference Value = QCE/Total AF

R Value	TRV (mg/kg-day)	Justification	Appropriate Functional Group
1	0.16	Test organism is in the same order and trophic level as the functional group members	none
2	0.08	Test organism is in a different order and same trophic level from the functional group members	M422, M422A
3	0.052	Test organism is in a different order and trophic level from the functional group members	M122, M122A, M121, M123, M132 M210, M210A, M222, M322